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GGUM

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GGUM: An R Package for Fitting the Generalized Graded Unfolding Model

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Abstract

In this article, the newly created GGUM R package is presented. This package finally brings the generalized graded unfolding model (GGUM) to the front stage for practitioners and researchers. It expands the possibilities of fitting this type of item response theory (IRT) model to settings that, up to now, were not possible (thus, beyond the limitations imposed by the widespread GGUM2004 software). The outcome is therefore a unique software, not limited by the dimensions of the data matrix or the operating system used. It includes various routines that allow fitting the model, checking model fit, plotting the results, and also interacting with GGUM2004 for those interested. The software should be of interest to all those who are interested in IRT in general or to ideal point models in particular.

Keywords

R package, generalized graded unfolding model, GGUM2004

The generalized graded unfolding model (GGUM; Roberts, Donoghue, & Laughlin, 2000) is arguably the most popular parametric item response theory (IRT) model for attitudinal or preference types of data. The GGUM is a so-called ideal point or *unfolding* IRT model. Under the ideal point paradigm, what matters the most is the perceived distance between the item's content and the person's position on the trait being measured: The smaller this distance, the larger the probability of endorsing the item. This paradigm is in contrast with the so-called *dominance* paradigm which underlies the most commonly used IRT models (e.g., the 1-, 2-, and 3-parameter logistic model for dichotomous items, or the graded response model and the partial credit model for polytomous items). The GGUM is suitable for data with mixed types of items (i.e., dichotomous and/or polytomous), including possible missing values.

There is freely available software for Windows to fit the GGUM (GGUM2004; Roberts, Fang, Cui, & Wang, 2006). However, GGUM2004 is limited in various ways, in particular in the sample size (maximum 2,000 persons) and test length (maximum 100 items) permitted. Also, the GGUM2004 is notoriously slow. The R package GGUM was developed to overcome these limitations. It is based on the same estimation algorithms as the original program (i.e., marginal maximum likelihood to estimate the item parameters and an expected a posteriori method to estimate the person parameters; Roberts et al., 2000), but without constraints

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regarding sample size or test length (it is also much faster). Therefore, the GGUM IRT model is now available for a whole new range of data sets. The R package GGUM allows fitting both the GGUM (Roberts et al., 2000) as well as the GUM (Roberts & Laughlin, 1996), which is a constrained version of the GGUM. Besides estimating the model parameters (and associated standard errors), the package includes a large set of utilities (e.g., to generate (G)GUM data, compute model probabilities, check model fit, and various plotting routines). Finally, functions are included that allow interfacing with GGUM2004 from within R, for those interested in this feature (thus effectively allowing to use GGUM2004 from R).

The R package GGUM is available free of charge from the Comprehensive R Archive Network (CRAN; <http://www.cran.r-project.org>) and it runs on all major platforms (Windows, Linux, and macOS). The latest package version, including all the code, may also be retrieved directly from <https://github.com/jorgetendeiro/GGUM>.

Declaration of Conflicting Interests

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